Eyetracking in the innovation process of a user interface – Usability-testing for product optimization

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5.1 Eyetracking in the innovation process of a user interface – Usability-testing for product optimization

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Abstract
When a new product is produced, it makes sense, to test the usability before its appearance on the market. Within such a test there are different methods which can be used. For example, the eyetracking method.

This research report illustrates how the eyetracking method can be used in combination with a qualitative inquiry to identify problems of a product.

The study was conducted in cooperation with the company K+U Printware GmbH in Ettenheim. The object of the study was the EcoCash recycling and selling machine (figure 5.1-1). The main element of this study is the identification of problems in the user interface and the handling of the machine. Furthermore, solutions to solve the problems were included.

Introduction
A substantial part of the human-computer-interaction is the guarantee of the usability of a product. In the software process the usability engineering is significantly connected to the human-computer-interaction. It guarantees that the usability is included from the beginning of the process of the software progress and that it outlasts the whole life cycle [1].

One important part of the usability engineering is the usability testing. These tests are used to guarantee the quality of the software [2]. Therefore the product can be further optimized before deployment.

The main part of this study is to find problems in the user interface and in the handling of the machine. With solutions a user-friendly optimization of the user interface can be followed. Moreover, when a target group is interviewed, the receptiveness of a user together with the resulting customer satisfaction can be clarified.

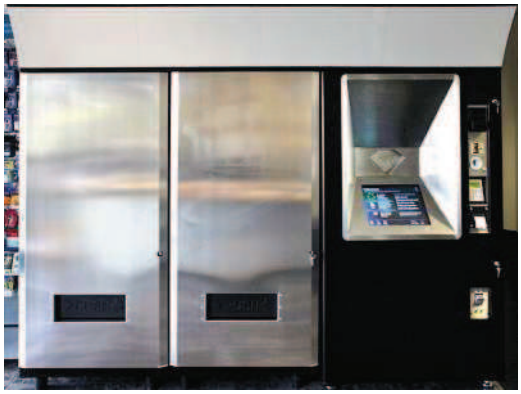

Fig. 5.1-1: *EcoCash recycling and selling machine*

Eyetracking study
Eyetracking is a method to register eye and gaze behavior [3]. It is used in several areas of research to match a research object to the user in context to the usability, in this case the EcoCash recycling and selling machine from the company K+U Printware GmbH.

With the eyetracking system the gaze movements and the points of attention of a user on a user interface have been analyzed and evaluated exactly. Despite the fact that the viewed objects on the user interface could precisely research which objects have been viewed and which have not. Furthermore, it was analyzed in which order the objects were inspected and conclusions were determined.

Within the eyetracking research the Headmounted Eyetracking Device (HED) has been used, which works with the cornea-reflex-method [4]. It is a camera-helmet-system, which consists of a helmet with a camera for the view and eye of the user and a laptop for recording the data.

The selection of the subject group followed a cover letter by mail to the university mailing list requesting participation. From this, an age group between 20 and 35 years could be chosen. The final target group was defined as a group out of 2/3 male and 1/3 female persons.

Preparation of study
Some tests were done ahead to become acquainted with the system. In the course of this, the adjustments of the system were analyzed, e.g. the brightness of the infrared camera or diverse parameters likes the pupil size.

Another test was conducted directly before the field-study. Further complications of the calibration were determined. In addition, the user interface of the machine was located between the stomach and chest height of a person, which influenced the calibration.

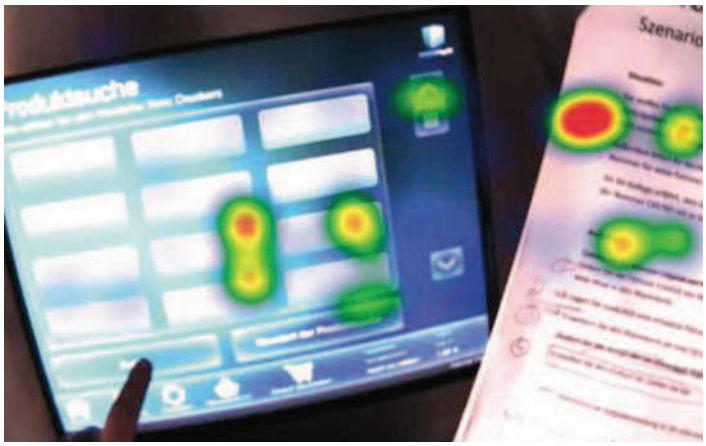

Fig. 5.1-2: *Decision for a printer name with the heatmap of the software BeGaze*

Results
During the evaluation of the data it has been found out how important a combination of both research methods is. The following examples will show how the objective perceptions of the eyetracking analysis confirm the subjective data of the interview.

Startscreen
From fifteen people, fourteen accessed with the first button on the left side of the user interface (to retour a cartridge). Only one person was interested from the beginning in the right-hand positioned information part of the user interface.

Speaking titles
After a product was registered by the machine during the recycling process the users came to a selection where the product could be cashed out and recycled or the process could be canceled. From the heatmaps of the software BeGaze it was clearly evident, that seven people jumped up and down between the two buttons. It can be inferred, that this was a result of the length of the buttons or a „not-understanding" of the message. In this step eight people took plenty of Position of the elements of the user interface.

Examining the results when buying a product, it became clear with the heatmaps that first an orientation of the results must be done (figure 5.1-2). As a result of the movements of a person there is a displacement of the heatmap. In this work step it became obvious through the viewing of the video material, that seven people did not find the scrollbar right away. Furthermore, two of these people went back to the main menu. In addition, two more people were trying to scroll up to find the lower number, which is a logical reaction to an alphabetic order.

Wrapping counter
From the video material of the wrapping counter it can be stated that ten of fourteen people did not find the wrapping counter shaft. Some people were searching at the shaft where the recycled product went in, in the area of the coin insert, below the user interface or even on the right side of the operator control module. Two people did not find the product without help of the researcher.

The payout
Notable problems were found during the withdrawal. A lot of time was needed to find the withdrawal slot by eight people, because they were searching above the coin slot. Moreover, it was mentioned in the video material that the coin return was inconvenient and hard for most of the people to use with one hand.

Conclusion
In summary, many important perceptions were worked out. With the help of the eyetracking study and the interviews, problems during machine usage were discovered. Considering these results, solutions to optimize the EcoCash recycling and selling machine were delivered. Improvements were suggested for the handling of the machine and furthermore relating to the user interface.

A usability of the recycling and selling machine is generally given. The machine finished all researched processes completely and is deemed to be effective.

Despite the given usability, some aspects can be more adjusted to the user. Among these would be the efficiency of the machine, self-explanatory application as well as the satisfaction of the user.

The usability evaluation shows several problems with the machine and the user interface, despite the upcoming problems within the eyetracking study. Indeed, some eyetracking studies are of high value, especially for new products. The interviews were an outstanding asset. The recycling and selling machine shows a high user acceptance. This potential can and should be used to place the new product on the market. As there are no similar products available and therefore no competitors in a strict sense, this market niche can be optimally used to strengthen the company in the market and to gain additional market shares.

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